



Wetlands Report

Estuarine Research Reserves In Virginia

Bland Crowder

The Chesapeake Bay National Estuarine Research Reserve in Virginia turned two years old this summer. Designated in 1991 with four sites in the York River Basin, it is the 21st member of the National Oceanic and Atmospheric Administration's National Estuarine Research Reserve System. (See article on page 7.)

Virginia's Reserve components represent key estuarine habitats that are still in essentially natural or pristine condition. The program's goals are to protect the Bay's natural resources, to conduct estuarine research that will aid coastal decision making, and to make a significant contribution to estuarine education in Virginia. The program is funded by the National Oceanic and Atmospheric Administration (NOAA), by the Commonwealth of Virginia as part of the Virginia Institute of Marine Science, and by private donors.

In the York River basin, the Reserve components are the Goodwin Islands at the mouth of the river in York County; the Catlett Islands in Gloucester County; Taskinas Creek

in James City County within York River State Park; and Sweet Hall Marsh on the Pamunkey River in King William County. The York River components represent the Bay,

as well as the estuarine, transitional and freshwater tidal zones of the basin.

Managed by Maurice P. Lynch, Ph.D., Professor of Marine Science, the Reserve eventually will represent these same salinity regimes on the other major tributaries of the Bay. Upon completion, the Reserve will be comprised of as many as 20 components including additional Eastern Shore sites.

Recently, assessments were completed for perspective sites on the Rappahannock, Potomac and Piankatank rivers. During this phase, public meetings were held on the Northern Neck to inform citizens on the Reserve's plans for growth in their region. Public reaction has been posi-



Lisa Ayers readies a cast net at the Catlett Islands. Her graduate project centers on the Goodwin Islands.

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The York River Reserve Sites

Goodwin Islands

An archipelago of saltmarsh islands surrounded by submerged aquatic vegetation beds, oyster reefs and shallow, open estuarine waters.

Location: Mouth of the York River in York County.

Salinity: 18-22 parts per thousand.

Size: 1,607 acres.

Special management policies:

Owned by The College of William and Mary. Managed exclusively for research and education, by permit only. Posted against hunting and trapping.

Catlett Islands

Parallel ridges of forested wetlands surrounded by saltmarshes, shallow water, and sandy shoals.

Location: 19 nautical miles upstream from the mouth of the York River in Gloucester County.

Salinity: 8-18 parts per thousand.

Size: 910 acres.

Special management policies:

Privately owned. Posted against trespassing; not open to the public. Use of the Reserve portion requires a permit.

Special management policies:

Accessible during park hours (8 a.m. to dusk) and under park regulations. Highlights include self-guided hiking trails, bridle paths, guided canoe trips, and picnic areas. Park open year-round; visitor center closed in winter. Research requires a permit.

Sweet Hall Marsh

Extensive tidal freshwater marsh with adjacent nontidal bottomland forests on the mainland side and shallow flats on the seaward side.

Location: 37 nautical miles from the mouth of the York River in King William County on the Pamunkey River.

Salinity: Freshwater, 0.5 part per thousand or less.

Size: 1,393 acres.

Special management policies: Privately owned; no public access. Use by permit only, limited to research and special educational projects.


Taskinas Creek

Tidal creek with marshes brackish at the creeks mouth and freshwater at its upper limits.

Location: 24 nautical miles upriver from the mouth of the York in York River State Park in James City County.

Salinity: 3-13 parts per thousand.

Size: 525 acres.



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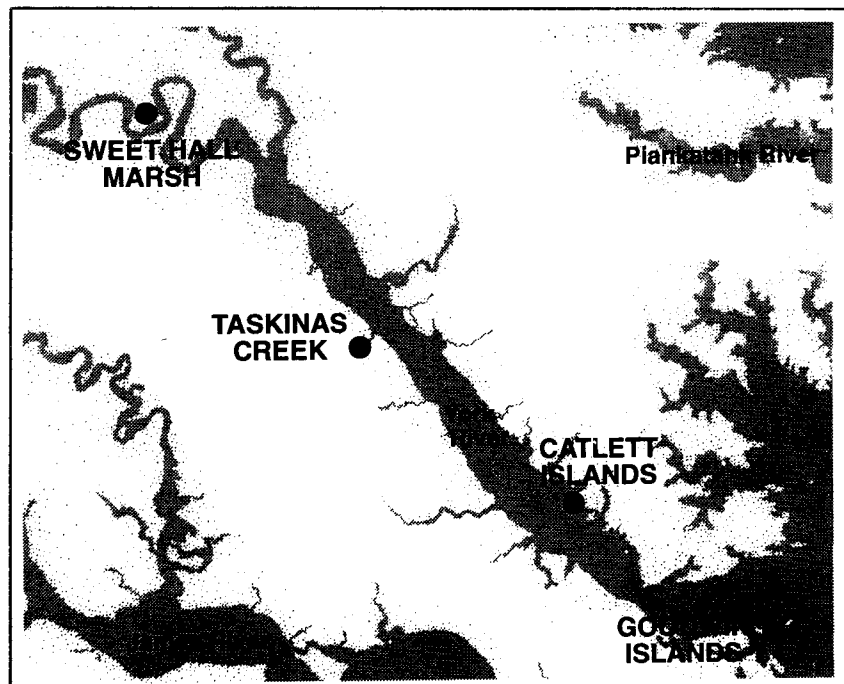
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Virginia's Estuarine Research Reserves



Geographic Information Systems

The Importance of Natural Resource Inventories

Carl Hershner and Marcia Berman

When Virginia established its tidal wetlands management program in 1972, the objective was to preserve and protect the Commonwealth's tidal wetland resources. At that time, although legislators and managers were convinced that tidal wetlands were valuable, no one really knew exactly how many wetlands there were, or exactly where they were.

It took almost twenty years for completion of the initial effort to map the location and extent of tidal wetlands in Virginia. The process was slow because the technology and the funding were inadequate to allow rapid, accurate mapping. Maps were generated by hand and were generally based on old paper maps and field visits.

During that entire period, state and local managers were busy trying to enforce regulations designed to prevent despoliation of tidal wetlands. When one asks the question now, "Did the past twenty years of management effort accomplish the goal of preserving the tidal wetland resources of Virginia?" No one has a definitive answer. No one knows exactly how the resource has changed over that time period. We do not have an accurate record of where marshes have been lost due to man's activity or natural processes, nor where marshes have appeared or expanded. On balance, we don't really know if we have more or fewer marshes than we did in 1972.


The most effective way to evaluate management programs like Virginia's tidal wetlands management effort, is to establish and maintain a continuing inventory of the resource. By accurately mapping and then remapping the resource on a regular basis, both current status and long term trends can be determined. Most experts in the field of coastal resource inventorying agree that a period of 5 to 10 years is best for repeating inventories. Mapping of extensive areas, such as Virginia's 5000+ miles of tidal shoreline and all the associated tidal wetlands, requires methods which are both accurate and rapid. Today, this implies use of computers and remote sensing. The Comprehensive Coastal Inventory program (CCI) at the Virginia Institute of Marine Science (VIMS) was established in 1989 to apply modern technology to the problem of inventorying and monitoring the Commonwealth's tidal shorelines.

CCI is currently engaged in developing a new series of coastal resource inventories. These products, which will

be generated for each local jurisdiction within the coastal plain, are designed to replace and update the old tidal marsh inventories and the original shoreline situation reports completed by VIMS in the 1970's and 1980's. The new products will be available in both digital and hardcopy formats with the first areas becoming available in mid-1994. Depending on funding levels, CCI will attempt to produce new inventories of all areas about once every ten years.

The biggest challenge in conducting an inventory program which can establish status and trends of a resource like wetlands, is the requirement for very high degrees of accuracy in mapping. If you wish to detect changes in position of shorelines or wetlands of one meter (3.2 feet) then the resolution of the two inventories which are compared to determine the change must be better than one half meter (1.6 feet). If both inventories are only accurate enough to indicate the position of a marsh's leading edge with an error of plus or minus one meter, an apparent loss of one meter in comparing the two inventories might actually represent variations from a loss of three meters to a gain of one meter.

The availability of maps and other forms of remotely sensed data at resolutions of one meter is practically unheard of within the private and public sector. Secured, classified federal programs have been using these kinds of products for national security purposes, however, they have not yet been made available for other uses. In the next decade we should see this change, and CCI is currently investigating future opportunities. Until then, aerial imagery is the best available source of data. The National Aerial Photography Program (NAPP) produces high altitude imagery which can resolve features to within two meters (6.5 feet). This is a considerable improvement over the standard U.S.G.S. topographic maps and the National Wetlands Inventory Maps which have an accuracy of only 10 meters (32.8 feet).

Several state agencies have financially contributed to the recent campaign for funds to update the existing 1989 set of color NAPP photography. The flight is scheduled for 1994. CCI will work with these and other imagery as they become available to quantify the losses and gains of wetland resources since the 1970's. 

The biggest challenge in conducting an inventory program...is the requirement for very high degrees of accuracy in mapping.



Terns

Julie Bradshaw

The graceful flight of terns is a common sight over Virginia's coastal waters in the summer. Terns are in the same family as gulls and are often seen in their company. Gulls and terns are similar in appearance; they are the white birds seen flying over the ocean, bay, and tributaries, and lighting on pilings and docks. But terns are generally more slender and graceful than gulls, have more pointed wings and bills, and most have more deeply forked tails, hence their common moniker "sea swallow." While gulls spend a fair amount of their time floating on the water, terns are very rarely wet, generally plunging from the air only briefly into the water to capture fish or other prey. On the wing, terns may be distinguished from gulls by their almost constant wingbeat, rather than soaring as gulls often do, and their habit of flying with their bills pointed downward, constantly searching for food in the water. Gulls generally fly with bills pointed forward. Historically, terns have been favored by fishermen for pointing out where to find fish.

One species of tern which deserves particular mention is the Arctic tern, the world's longest distance migrant. This tern migrates approximately 22,000 miles each year, from the Arctic, where it breeds, to the Antarctic, and back. The Arctic tern is occasionally in Virginia, especially offshore.

The six species of terns that are commonly seen in Virginia's coastal waters are least, Forster's, royal, Caspian, common and gull-billed. In breeding plumage, all are white with a black cap. Male and female of each species look alike. Most of these species nest in large colonies, sometimes mixed with other species of terns, gulls, black skimmers and others, as a defense against predators. It is difficult to stumble upon a tern colony; as an intruder approaches, the adults get off their nests, join a raucous chorus, and dive on the intruder, sometimes striking it with their bills or sometimes just defecating on the intruder in an attempt to chase it away. Colonies are generally located on isolated beaches, islands, or sand bars; isolation is sought from predators such as raccoons and foxes. The nest is often merely a scrape or depression in the sand. Coloring on eggs and young chicks is similar to their shell and sand surroundings making it difficult for predators to spot them. Live fish constitute the main portion of terns' diets, but they also eat crabs, shrimp, frogs, and insects.

The smallest tern commonly seen along Virginia's coast is the least tern. It is 8 1/2 to 9 1/2 inches long, slightly

Atlantic Croaker

Micropogonias undulatus

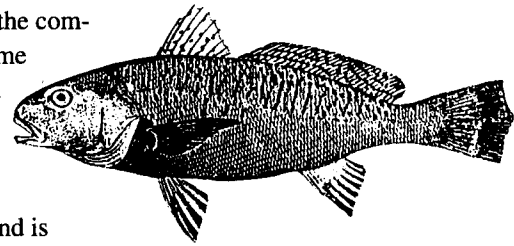
Lyle Varnell

Atlantic croaker are common summer visitors to the Chesapeake Bay area and are an important species to the commercial and recreational fishing industries. Croaker belong to the family *Sciaenidae* which also include spot, gray and speckled trout, red and black drum, silver perch and the kingfishes. Morphological characteristics include a silvery body with slightly diagonal narrow dark lines or rows of spots on their dorsal side. They are distinguished from other *Sciaenids* by their spotted dorsal fin and the many small barbels on their lower jaw. They range in size up to approximately 20 inches and four pounds. *M. Undulatus* is able to create a deep, broken sound somewhat similar to its close relatives the drums.

Hence, the common name croaker.

The purpose of this sound is

unknown, however, it is believed to be used for predator avoidance or during other times of stress and/or as a mating behavior.



Atlantic croaker are commonly found along the Atlantic Coast from Massachusetts to the northern Gulf of Mexico and northern Mexico, but are uncommon north of New Jersey. They are generally absent in the waters of south Florida. They also inhabit the waters from southern Brazil to Argentina.

Adults overwinter in deeper waters off of the coast of Cape Hatteras. During the spring, migrations occur into the Chesapeake Bay. Croaker are multiple spawners with indeterminate fecundity. Spawning occurs from July to December, but individual fish generally spawn for only two to three months. Spawning begins in the Chesapeake Bay and continues during fall migrations when the fish move offshore and south. The fall migration of croaker begins in August/September. It is currently believed that males begin their migration earlier than females. It was once believed that two separate Atlantic stocks of croaker existed—one north and one south of Cape Hatteras. Recent VIMS studies suggests this theory should be re-evaluated.



Natural Places to Visit



Newport News City Park

Pam Mason

Location: Newport News. From Route 64, exit onto Route 105 east and make first left onto Jefferson Avenue. The park entrance is on the right just past Ft. Eustis Blvd. The Interpretive Center is about one mile on the right. You can get maps and information at the center.

Details: Situated between two reservoirs, the park is owned by the City of Newport News. Boats, canoes and bikes are available for rent and fishing is allowed with a license. There is a sensory trail for sight-handicapped individuals which begins and ends at the Interpretive Center. Camping is available year round. For information contact Newport News City Park, 13564 Jefferson Ave., Newport News, VA 23603 (804) 877-5211. The Nature Center phone is (804) 877-7411.

A 6.5 mile nature trail begins at the Interpretive Center and winds through the forest and the swamp. Water levels in the reservoirs and adjacent swamp vary seasonally. While the swamp is flooded through most of the winter, only areas closest to the

reservoir are under water during drier summer months.


White ash and red maple dominate the swamp canopy. Growing beneath the ash and maple and further into the water are hazel alder, buttonbush and red-osier dogwood. Black willow and willow oak are also common. In the spring and summer, smartweed, swamp loosestrife, beggars-tick and arrow arum grow along the waters edge. Great clumps of green-gray mistletoe can be seen in the bare hardwood trees in winter. The mistletoe is a parasite which sends roots into the tree to get nutrients. The lowland forest along the edges of the swamp is dominated by red maple, sycamore, water oak, white and green ash and swamp chestnut oak.

Some areas of upland forest are growing on old earthworks—remnants of Civil War fortifications. The earthworks are found along the nature trail. The canopy of the upland forest is dominated by oaks, hickory and loblolly and Virginia pine. American holly, dogwood, redbay,

persimmon and pawpaw occupy the understory.

Many varieties of wildflowers are found in the woods. Mayapple, spiderwort and pink lady's slipper bloom in the spring. Several orchids bloom in the summer including; crane-fly orchid, nodding ladies' tresses and the rattlesnake plantain.

Waterbirds are abundant. In the late fall and winter, whistling swans and Canada geese inhabit the reservoir. Wood ducks are year-round residents nesting in the trees and feeding on the abundant wetlands vegetation. A very large blue heron rookery is located in the woods north of the swamp bridge.

The park is the northernmost location for the poisonous eastern cottonmouth snake. The endangered canebrake rattlesnake is also found in the park. The abundant shallow water provides habitat for many amphibians and turtles. There are 28 species of salamanders, frogs and toads in the park. Look for slider turtles sunbathing on logs along the banks of the swamp. 

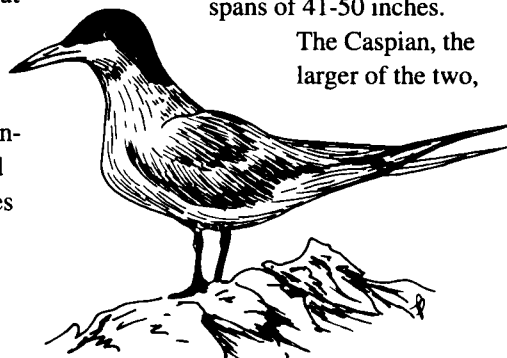
Terns

continued from page 4

shorter than the robin (9-11 inches), however, the tern's wingspan is about 20 inches, compared to the robin's 14-16 inches. Nesting is more cosmopolitan for least terns than for other terns. It often nests on the mainland and doesn't require the isolated island habitat that some other species prefer. The least tern will nest in loose colonies or solitarily. It is sometimes associated with piping plovers, common terns, and black skimmers.

The largest terns are the royal and Caspian species that reach heights of 18-23 inches with wingspans of 41-50 inches.

The Caspian, the larger of the two,



Forster's Tern

and is distinguished by its heavy, bright red bill. Although a few Caspian terns nest in Virginia, it is at the northern end of their breeding range, and they are more likely to be seen in migration than during the breeding season. The Caspian tern's flight is more gull-like than other terns. Among terns, it provides the longest known parental care for its young, staying with its offspring during migration up to 7 months past fledging.

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Estuarine Research Reserves in Virginia
continued from page 1

tive and official designation for these sites is expected in two years or less.

Diverse research projects are underway on the Reserve sites, including studies of blue crab predator-prey relationships and recruitment; fiddler crab populations, parasitology and behavioral ecology; and submerged aquatic vegetation transplanting and mapping. In addition to William and Mary, institutions involved in research on the Reserve sites include Virginia Tech, North Carolina State University, the Smithsonian Institution, Mary Washington College and East Carolina University. Jeffrey Shields, Ph.D., is research coordinator.

Monitoring projects underway at Reserve sites include long-term studies of surface water and groundwater

quality; birds; estuarine debris; and plant communities. Additional monitoring projects are planned. One purpose of monitoring programs is to find indicators of change in the environment. For example, if saltwater



Chesapeake Bay
National Estuarine
Research Reserve
in Virginia

began intruding farther into the York River estuary, shifts in plant community composition would help document the effects of this change. Rob Breeding is monitoring coordinator.

The Reserve's education effort includes formal and informal presentations to classes and diverse groups, traveling exhibits, publications and volunteer programs. A major thrust is to provide datasets monitoring programs to teachers, so that they may teach the importance of studying phenomena throughout an estuarine system over time. Data are being made available via educational computer networks. Bland Crowder is education and communications coordinator.

For more information about the Chesapeake Bay Research Reserve in Virginia or its quarterly newsletter, *a fair Bay*, write the Reserve, c/o Virginia Institute of Marine Science, P.O. Box 1346, Gloucester Point, Virginia. 23062. ➡

Terns

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Royal terns are slightly smaller than Caspians, and have a more slender orange bill. One of the royal tern's most interesting characteristics involves breeding. Royals nest in more closely packed colonies than other terns. Their defensive strategy against intruders tends more toward closing ranks and standing their ground rather than flying and diving on intruders. Once hatched, the young in the colony gather closely in a group called a crèche (pronounced kresh). The parent, returning to the crèche with food, recognizes its own chick's call, responds, and they meet at the edge of the crèche for feeding.

The intermediate size of common and Forster's terns reach about 14 1/2 inches in length with wingspans of 30 inches. Although both are pale gray on the upperwings, the common tern is slightly darker with dark gray wingtips. In comparison, the Forster's tern appears almost white on the upper wings. The Forster's nesting habitat is unique among Virginia's breeding terns. It nests in marshes rather than on beaches or dunes, sometimes on detritus mats.

The gull-billed tern is slightly larger than the common and Forster's terns. Its distinguishing features are both its appearance and its food choice. As its name implies, its bill is more gull-like (i.e., thick, short, and black) than other terns. Its tail is also shorter and less deeply forked than other terns. While most tern species prefer fish, the main component of the gull-billed tern's diet is insects, which it captures while flying over marshes, water or agricultural fields.

In the past, several tern species were nearly extinguished by the millinery trade, with feather hunters killing thousands of birds for their delicate plumes, used on women's hats. Egg collecting was another destructive influence on tern populations. Insecticides, especially DDT, have also taken their toll on terns through poisoning of the food chain. Tern populations have rebounded from these previous pressures, but they are still at risk through destruction of nesting habitat by development and disturbance by people and pets. 🐦

Structurally Speaking...

Wood Preservative Treatments for Marine Construction

Walter I. Priest, III

The use of wood in marine related construction has always been complicated by the actions of marine borers in addition to the normal decay processes of bacteria and fungi. There are two main groups of marine borers, shipworms (mollusks) and gribbles (crustaceans). In Virginia the primary concern is with the shipworms, *Teredo navalis* and *Bankia gouldi*, and to a much lesser extent the gribble, *Limnoria tripunctata*, which is only occasionally found this far north. The distribution of these organisms is highly dependent on water temperature and salinity. Although generally more common in high salinity areas, they can penetrate well into estuaries particularly during periods of drought when salinity levels are unusually high.

In order to protect wooden structures, treatments have been developed that make the wood unpalatable to these organisms as well as bacteria and fungi. The two most commonly encountered treatments are creosoted and salt-treated. In these processes, the wood is pressure-treated with creosote, a coal tar

distillate, or one of several inorganic salt solutions including: chromated copper arsenate (CCA-C), ammoniacal copper arsenate (ACA) or ammoniacal copper zinc arsenate (ACZA). There are several levels of treatment depending on the intended use. These treatment levels are expressed in terms of the pounds of preservative retained per cubic foot of wood (pcf). The enclosed table provides the levels

AWPA Recommended Treatment Levels (pcf)		
	CCA-C, ACZA or ACA	Creosote
Lumber		
Above ground	0.25	8
Soil contact and freshwater use	0.40	10
Permanent wood foundation	0.60	NR
Salt water use	2.50	25
Piles		
Land or freshwater use and foundations	0.80	12
Salt water	2.5 (0 to .5 inches) & 1.5 (.5 to 2 inches)	20
NR= Not recommended		

of treatment recommended by the American Wood Preservers Association (AWPA) for different uses of wooden piles and lumber that would typically apply to Virginia.

The uptake of these preservatives is greatest in the sapwood with considerably lesser amounts absorbed by the heartwood. Consequently, it is important to seal and/or cover the tops of pilings and treat all cut surfaces with additional preservative to prevent the deterioration of the wood from the inside out. The useful life of the structure can also be increased by minimizing the direct exposure of the heartwood to shipworms. 🐞

The National Estuarine Research Reserve System

Recognizing the threats that humans pose to our estuaries, Congress created the National Estuarine Research Reserve System, within the National Oceanic and Atmospheric Administration (NOAA), under the Coastal Zone Management Act of 1972. The Reserve program is dedicated to fostering a system of estuarine reserves that represents the wide range of coastal and estuarine

habitats found in the United States and its territories. In pursuit of that goal, the System works with federal and state authorities to establish, manage and maintain Reserves, and to provide for their long-term stewardship. At present, 425,000 acres in 17 states and Puerto Rico are protected by the System.

Research and education are crucial to meeting this goal. Reserves

serve as laboratories and classrooms where the effects of both natural and human activity can be monitored and studied.

For more information about the National Estuarine Research Reserve System, write the Reserve, c/o the Virginia Institute of Marine Science, P.O. Box 1346, Gloucester Point, Virginia 23062.

*Croaker**continued from page 4*

Larvae are hatched at sea where they spend their first few days. Postlarvae move into estuarine waters during the fall and winter. Juveniles inhabit Virginia's coastal waters and bays from September to November and waters of the Chesapeake Bay during the spring and summer. Juveniles prefer waters with an average salinity of about 18 parts per thousand, which is approximately in the mid-Bay region during the summer. All croaker are sexually mature at the end of their second year. Greater than 85% are mature by the end of their first year. Females are generally mature at 173 mm (6.8 inches). Males are slightly larger at maturity (182 mm or 7.2 inches total length).

Adult croaker are bottom feeders that prefer mud or sandy substrate.

Their prey includes benthic invertebrates, detritus, crabs and small fish. Croaker frequent intertidal marsh areas during high tides and forage within the wetlands. Smaller fish

Calendar of Upcoming Events

November 4 - 7	"The Future of America's Rivers" Conference Stouffer Concourse Hotel, Arlington, Virginia Contact Jennifer Paugh at 202-833-3380
November 10 - 13	2nd International Conference on Environmental Management of Enclosed Seas (EMECS) Baltimore Convention Center, Baltimore, Maryland Contact Helene Tenner, Director, at 410-974-5047
November 14 - 18	12th Biennial International Estuarine Research Federation Conference "The Science and Management of Coastal Estuarine Systems" Hyatt Regency Hotel, Hilton Head, South Carolina For more information, call Joy Bartholomew, Executive Director, at 410-586-0997
January 22, 1994	1st Annual Meeting of the Virginia Association of Wetland Professionals (see insert) Virginia Institute of Marine Science, Gloucester Point For more information, call Jim Perry at 804-642-7388

are believed to use wetland vegetation and beds of submerged aquatic vegetation (SAV) as refuge habitat. ➡



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